de maximis, inc.

186 Center Street
Suite 290
Clinton, NJ 08809
(908) 735-9315
(908) 735-2132 FAX

April 19, 2013 ***VIA ELECTRONIC & US MAIL***

Mr. David Q. Risilia
Supervising Environmental Specialist
Office of Dredging and Sediment Technology (ODST)
P.O. Box 028
Trenton, New Jersey 08625-0028

Re: Response to Office of Dredging and Sediment Technology (ODST) April 12, 2013 Letter
Second Request for Additional Information
River Mile 10.9 Removal Action of the Lower Passaic River
Waterfront Development Permit Equivalency Submission
DEP LUR 30232-05-0001.2/ 13000 Eq

Dear Mr. Risilia:

de maximis, inc. is submitting this response on behalf of the Cooperating Parties Group (CPG). It is our understanding based on the CPG/NJDEP April 17, 2013 teleconference that this submittal will provide ODST the information it needs to conditionally approve the CPG's Waterfront Development Permit (WDP) in time to allow the CPG's Tidelands application to be included for consideration at the Tidelands Council's May 1 meeting. We appreciate ODST's efforts in this regard.

The submittal consists of this letter which summarizes CPG's responses to the numbered paragraphs in ODST's April 12 letter, plus;

Addendum 1.	A letter from Clean Harbors confirming acceptance of RM 10.9 sediment and decant water at respectively, its Oklahoma landfill and either its Connecticut or Maryland wastewater treatment facilities;
Addendum 2.	A draft Water Quality Monitoring Plan;
Addendum 3.	Specification and Typical Planned Placement for Silt Curtains;
Addendum 4.	Statement of Compliance with Subchapter 10 rules of the Flood Hazard Area Control Act; and
Addendum 5.	PowerPoint slides requested during the April 17 conference call to support a presentation to the Tidelands Council.

Provided under separate cover are 5 full size color sets of each of the following drawings which were originally submitted in full size, signed and sealed on April 10 and which have been revised pursuant to comments received from ODST on April 12:

- Figure 1 – Topographic Map
- Figure 2 – Site Layout
- Figure 3A – Pre-Removal Area Details (Sheet 1 of 2)
- Figure 3B – Pre-Removal Area Details (Sheet 2 of 2)
- Figure 4A – Post-Removal Area Details (Sheet 2 of 2)

- Figure 4B – Post-Removal Area Details (Sheet 2 of 2)
- Figure 5A –Intertidal and Subtidal Areas (Sheet 1 of 2)
- Figure 5B – Intertidal and Subtidal Areas (Sheet 2 of 2)
- Figure 6A – Capping Cross Sections (Sheet 1 of 3)
- Figure 6B – Capping Cross Sections (Sheet 2 of 3
- Figure 6C – Capping Cross Sections (Sheet 3 of 3)

In addition, this submission includes 5 full-size color sets, signed and sealed of each of the following drawings. This information was originally included in the draft Final Design Report., ODST requested in the April 17 teleconference that it be added in full-size to the WDP application package:

- Figure 7A – Dredging Cross Sections (Sheet 1 of 14)
- Figure 7B – Dredging Cross Sections (Sheet 2 of 14)
- Figure 7C – Dredging Cross Sections (Sheet 3 of 14)
- Figure 7D – Dredging Cross Sections (Sheet 4 of 14)
- Figure 7E – Dredging Cross Sections (Sheet 5 of 14)
- Figure 7F – Dredging Cross Sections (Sheet 6 of 14)
- Figure 7G – Dredging Cross Sections (Sheet 7 of 14)
- Figure 7H – Dredging Cross Sections (Sheet 8 of 14)
- Figure 7I – Dredging Cross Sections (Sheet 9 of 14)
- Figure 7J – Dredging Cross Sections (Sheet 10 of 14)
- Figure 7K – Dredging Cross Sections (Sheet 11 of 14)
- Figure 7L – Dredging Cross Sections (Sheet 12 of 14)
- Figure 7M – Dredging Cross Sections (Sheet 13 of 14)
- Figure 7N – Dredging Cross Sections (Sheet 14 of 14)

All drawings are also being provided electronically on a CD for ease of viewing.

Detailed Responses

As agreed to during the NJDEP-CPG's April 17, 2013 teleconference, the following information is provided in response to the numbered paragraphs in ODST's April 12 letter.

(1) There are 12 sheets, however the package contains two sheets numbered 8, and one is identified as 'sheet 8 of 11' the other 'sheet 8 of 12.'

- Sheets have been renumbered to reflect the revised drawing list.

(2) The legend is incomplete and thus the plans difficult to interpret. No descriptions or labels have been provided for the various colored line areas. Some areas contain labels such as Navigation Channel but lack arrows depicting the limits/boundaries of said areas.

- Legends have been included on each drawing for the various lines/hatching associated with each. The navigation channel is defined by a blue line as indicated in the legends.

(3) **The separation between the navigation channel and the limit of dredging is unclear. At locations they appear to overlap. The Draft Final Design Plans do not agree or depict corresponding distances to the navigation channel.**

- The navigation channel boundary has been made clearer and is consistent with the draft Final Design plans. On the smaller scale figures (such as Figure 2), the Removal Area boundary may appear to overlap the navigation channel; this is due to figure scale. The relationship can be seen more clearly on the larger scale figures. As shown on Figure 4B and the corresponding cross sections, a box cut will be made at the Removal Area boundary, resulting in a vertical face at the boundary limit.

(4) **Sheet 4 of 12 contains note No. 10 stating "the Removal area boundary shown is based on regulatory accepted limits of contaminated sediment and are not to be interpreted as the boundary of dredging." This remark must be clarified. Any Permit Eq. if one were issued, must reference plans depicting the full extent of regulated work which includes dredging. Accordingly, the removal area boundary and limits of dredging must be in agreement. Please remove the note or provide a complete written explanation.**

- The note has been revised to "The Removal Area boundary is based on regulatory accepted limits of contaminated sediment."

(5) **The cross sections provided are not complete. Many more cross sections are depicted in the reduce scale plans of the Draft Final Design Document. This submission must be as or more complete than the Draft Final Design Document.**

- All cross-sections included in the draft Final Design Report are included in this submittal. During the 4/17/2013 teleconference NJDEP stated its concern about CPG's plans for subtidal areas with steep slopes. As depicted on the drawings, the northern reach of the dredge area will not be capped because the slope in that area is too steep to support a cap. Sediment in that area will be dredged to native soil.

(6) **Sheet 4 of 12 contains note No. 18 stating: "The long term stability of uncapped areas abutting cap will not be impacted and will be monitored as part of the Cap Long Term Monitoring and Maintenance Plan." Said plan has not been provided and this is item is the subject of the ongoing review of the Design Document. Plan notes should be limited to relevant factual information and therefore this note should be removed or modified.**

- The note has been removed.

(7) **Sheet 8 of 12 contains a label that it connects to Figure 5B, however no figure 5B was provided in the plan set. Please rectify.**

- Figure 5B was indicated in the Drawing Index and was included; the sheet had a typographical error and was mislabeled Figure 3B. The error has been corrected.

(8) **There is no sheet depicting silt curtains, specifications thereof, or their manner of deployment. Please provide.**

- The specifics for how silt curtains will be deployed will not be available until the pre-construction plans are developed by the selected Subcontractor. As agreed to in the 4/17 teleconference, CPG is providing technical specifications and details for the silt curtain system, and a schematic of a typical deployment configuration.

(9) **As previously stated by the Department the AUD process shall apply to the processing facility and shall require demonstration that the processing facility is able to accept and process this material inconsideration of its contaminated character. It is acknowledged that stabilized RM 10.9 sediment is proposed to be disposed of at an out of state RCRA Subtitle C Landfill and not reused. The Department previously requested a letter of acceptance from the final facility accepting the dredge material. The applicant has provided a letter of acceptance from Clean Earth Dredging Technologies. Clean Earth is the processing facility and not the final acceptance site. Accordingly, please provide the document which was specifically requested.**

- Attached to this submittal is the requested letter from Clean Harbors. This is the same letter provided to NJDEP on 4/12/2013.

(10) **By way of the previous request for additional information letter, ODST indicated that the processing facility treating the RM 10.9 sediment must also address where RM 10.9 supernatant/wastewater will be sent for final treatment/disposal. Accordingly, the submission of a letter of acceptance from the source identified as accepting the dewatered water/supernatant must be provided. No such letter has been provided. Therefore this item remains deficient.**

- Attached to this submittal is the requested letter from Clean Harbors. This is the same letter provided to NJDEP on 4/12/2013.

(11) **In order to comply with this Rule the applicant must demonstrate that all applicable water quality standards are met within the removal site and associated adjacent waters during the dredging and capping process and after the removal action is completed. Accordingly, the applicant must provide, at a minimum, a draft water quality management plan (WQMP) which substantively addresses and**

incorporates all comments conveyed by the Department during the review of the Draft Final Design Report. Upon review of said draft WQMP by the Department (and demonstrated compliance with all other outstanding CZM and FHA items) a determination will be made if a Permit Equivalency can be issued conditioned upon the acceptance of the WQMP in the Final Design Report.

- Attached to this submittal is a draft Water Quality Monitoring Plan. In addition to continuous monitoring for turbidity and TSS during the dredging operation, it also specifies weekly monitoring for TCDD, PCBs and Hg at three locations, one immediately above and one immediately below the RM 10.9 Removal Area, and one at the Remedial Investigation Chemical Water Column Monitoring location RM 10.2. Additional sampling for these compounds will occur during up to three additional events at stations where turbidity is measured above the agreed upon action level.

(12) **The response letter states that the Flood Hazard Area Control Act rules are not applicable to the RM 10.9 Removal Action. Typically, challenges to the basic applicability of particular regulations occur during the pre-application phase, well in advance of the application submission. The Department maintains that the Flood Hazard Area Control Act rules apply to the proposed activity and therefore compliance with these Rules is necessary.**

- The RM 10.9 Removal Action complies with the Flood Hazard Area Control Act rules as specified in CPG's April 10 submittal, and as repeated in the attached Statement of Compliance with Subchapter 10 of the Flood Hazard Area Control Act.

(13) **Existing condition values of Manning's "n" values have been reported to range from 0.025 to 0.032. Proposed condition values have been reported to range between 0.022 and 0.027. An application of Manning's equation reveals that the range in "n" values will alter the carrying capacity of the river during smaller storm events. This could lead to additional flooding, which is counter to the Flood Hazard Area Control Act rules. In addition, the April 10, 2013, resubmittal letter states the "n" values will be made smoother in the proposed condition. This implies that the river would then have a greater capacity to convey water, which could lead to additional flooding, at least in smaller storm events. This is not permissible under the Flood Hazard Area Control Act rules. The Manning's n values must be further defined in the existing condition to determine if the range of "n" values in the river today exhibit as much variability as stated by the applicant. In addition, it is suggested recommended that the material to be placed in the river match the "n" values of the existing condition. This will avoid concerns over additional flooding along the river in the smaller storm events. Otherwise, more formal analyses will be required.**

- Moffatt and Nichol (CPG's modeling consultant) utilized a Manning Coefficient of 0.023 $m^{1/3}$ / s in the Delft3D high definition hydraulic model developed for the RM 10.9 Removal Area. The existing sand specification for the top layer of the cap has a median Manning Coefficient of 0.024 $m^{1/3}$ / s which is within the $\pm$0.002 $m^{1/3}$ / s allowance from existing conditions that Peter DeMeo (NJDEP) indicated was acceptable during the 4/17/2013 teleconference. In summary, the sand that will form the top layer of the Removal Area cap will be equivalent in roughness to the sediment it will replace. It should also be noted that in-river restrictions such as the Rte. 3 and Dejessa Park Avenue bridges located upstream and downstream of the RM 10.9 Removal Action area, effectively provide hydraulic gradient control during high flow events, moderating the impact of minor surface roughness differences in the Removal Area.

If you have any questions, please contact Stan Kaczmarek or me at (908) 735-9315.

Very truly yours,

de maximis, inc.

Willard Potter
CPG Project Coordinator

cc: Stan Kaczmarek, dmi
William Hyatt, CPG Coordinating Counsel
Jay Nickerson, NJDEP
Suzanne Dietrick, NJDEP
Roger McCready, CH2M Hill
Ray Basso, USEPA

Addendum 1: Letter from Clean Harbors

Clean Harbors Environmental Services, Inc.
400 Arbor Lake Drive, Ste. B - 900
Columbia, SC 29223
803-691-3427
www.cleanharbors.com

April 11, 2013

Mr. William Potter
CPG Project Coordinator
Demaximis, Incorporated
186 Center Street
Clinton, New Jersey 08809

RE: Passaic River Project

Dear Mr. Potter,

This letter confirms that Clean Harbors Environmental Services, Inc (CHES) has reviewed available data and information regarding the sediment and decant water, that will be generated during dredging activities at the Lower Passaic River Mile 10.9 project, and finds that these wastes are acceptable at the designated and approved disposal facilities. The following facilities will be utilized:

1) Decant water: CHES Baltimore facility or CHES Connecticut facility;

2) Sediment: CHES Lone Mountain, Waynoka, OK;

CHES remains wholly committed to this endeavor and looks forward to a safe and successful project. If you have any questions concerning this correspondence, please do not hesitate to contact me directly at 803-691-3427 or, via email retallick.phillip@cleanharbors.com.

Sincerely,

Phillip G. Retallick
Senior Vice President for Compliance and Regulatory Affairs
Clean Harbors Environmental Services, Incorporated

"People and Technology Creating a Better Environment"

Addendum 2: Draft Water Quality Monitoring Plan

Draft

River Mile 10.9 Removal Action
Lower Passaic River Study Area

Water Quality Monitoring Plan

Prepared for

Cooperating Parties Group, Newark, New Jersey

April 19, 2013

CH2MHILL®

One South Main Street
Suite 1100
Dayton, OH 45402

Contents

Acronyms and Abbreviations

°C	degrees Celsius
BMP	Best Management Practices
COPC	chemical of potential concern
DOC	dissolved organic carbon
FW	Fresh Water
mg/L	milligrams per litre
LPR	Lower Passaic River
LPRSA	Lower Passaic River Study Area
m	meter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NTU	Nephelometric Turbidity Units
NJDEP	New Jersey Department of Environmental Protection
NJAC	New Jersey Administrative Code
NT	Nontrout Waters
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCDD	Polychlorinated Dibenzo-p-dioxins
PCDF	Polychlorinated Dibenzofurans
PWCM	Physical Water Column Monitoring
CWCM	Chemical Water Column Monitoring
POC	particulate organic carbon
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RM	River Mile
RI/FS	Remedial Investigation / Feasibility Study
SSC	Suspended Solids Concentration
TDS	Total Dissolved Solids
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
WCM	Water Quality Monitoring
WQMP	Water Quality Monitoring Program
QAPP	Quality Assurance Project Plan

Introduction

1.1 Overview

This Water Quality Monitoring Program (WQMP) prescribes appropriate management measures and monitoring for the protection of the existing water quality in the Lower Passaic River during dredging and capping operations conducted for the River Mile (RM) 10.9 Removal Action (Removal Action).

1.2 Program Objectives

The main objective of this program is to identify surface water monitoring and management response measures to be implemented during dredging and capping operations. This program details the monitoring and associated trigger values, which if reached, will be used to initiate further investigation into the causes(s) and impacts that these works may be having on the river water quality and to determine the appropriate management response. This response may include temporary cessation (stop work) of dredging and capping activities if the impact is found attributable to RM 10.9 activities, to allow for time to effectively resolve the matter and assure that water quality levels return to below trigger values.

1.3 Existing Conditions

Evaluation of real-time impacts to water quality during the dredging and capping operations requires an understanding of the existing conditions prior to the Removal Action and of natural variability in the monitoring parameters. There has been an extensive Physical Water Column Monitoring (PWCM) and Small Volume Chemical Water Column Monitoring(SV CWCM) Programs for the Lower Passaic River Study Area (LPRSA) Remedial Investigation/Feasibility Study (RI/FS) since 2009. This data includes suspended solids and particulate organic carbon (POC) collected at two stations(RM 10.2 and RM 13.5) that bound the RM 10.9 Removal Area. Summary tables have been prepared for these parameters and provided as Attachment 1.

Data for the following COPC parameters POC, 2,3,7,8 TCDD, Total TCDD, mercury(dissolved and total), Total PCB Congeners, and suspended solids are provided from the SV CWCM sampling events 1, 2, 3, 4, 5, Low Flow and High Flow from 2011 and 2012 for RM 10.2. This data will be evaluated to further inform the monitoring.

The primary parameters that will be used to directly monitor the dredging and capping operations are total suspended solids and turbidity. RI water column monitoring data collected at RM 10.2 in 2009 and 2010 have an average total suspended solids (TSS) concentration of 29 mg/L, with a standard deviation of 29 mg/L and a maximum of 174. The average turbidity was 20 NTU, with a standard deviation of 16 NTU and maximum of 220 NTU. The entire RI Water Column Monitoring data sets will be used to evaluate what level of correlation may exist between TSS and turbidity at this site. The result will determine whether turbidity can be a real-time surrogate for TSS or if TSS will need to continue to be

collected as a measure of resuspension during the water column monitoring. If the correlation is fair to good then TSS and turbidity data collected during the RM 10.9 pre-dredge monitoring period will be used to confirm this correlation and used during the monitoring of the dredging activities.

The extensive RI Water Column Monitoring data sets will provide the baseline for the ambient conditions of the river relative to COPCs. An evaluation of this data relative to correlation of TSS/turbidity to the COPCs will be performed.

Proposed Controls

2.1 Overview

The proposed Removal Action dredging and capping operations have the potential to disturb and suspend sediments within the water column, which if uncontrolled may cause impacts on the immediate and downstream river environment. Further details of the dredging and capping activities, including volumes and equipment, are provided in the Draft Final Design Report, which was submitted and reviewed separately by the United States Environmental Protection Agency (USEPA) and New Jersey Department of Environmental Protection (NJDEP).

This Program describes a water quality monitoring regime to identify conditions that have the potential to cause adverse environmental impacts based on the exceedance of trigger levels and to respond to and manage such events, including investigation and mitigation measures.

Dredging Best Management Practices (BMPs) will be implemented during the RM 10.9 Removal Action as described in the Draft Final Design Report, consistent with the NJDEP Dredging Technical Manual "The Management and Regulation of Dredging Activities and Dredge Material Disposal in New Jersey's Tidal Waters (Oct 1997) (*NJ Dredging Manual*), and as necessary to reduce the potential for river water quality impacts during the project, as described below.

2.2 Dredging/Capping Environmental Controls

2.2.1 Silt Curtains

As described in the Draft Final Design Report and the Waterfront Development Permit-Equivalent Application, dredging activities will be conducted within a silt curtain/boom system to conservatively manage potential resuspension during dredging operations for the RM 10.9 Removal Action. The silt curtain/boom systems are summarized here.

The use of silt curtains to manage resuspension during dredging is a USACE-recognized project management practice (USACE, 2005, 2008) and is an accepted Best Management Practice (BMP) in the *NJ Dredging Manual*. The silt curtain/boom systems to be used are designed specifically for silt control in rivers, intercoastal waterways, bays, and harbors and will be deployed around the perimeter of the dredge plant. The cell/moon pool system will be used to suspend the silt curtains and boom from the flotation barges using either chains or cables. This configuration reduces the area subject to resuspension at a given time and minimizing the potential for large scale resuspension. The contractor may choose to revise the alignment, based on the capabilities of their equipment.

The perimeter of the silt curtain system will be marked by buoys. The silt curtain skirt will be long enough to direct resuspended sediment toward the bottom, and booms will be located sufficiently far

from dredging activities that any potentially suspended materials will reach the river bottom before the current carries them beyond the boom.

2.2.1.1 Description

The silt curtain systems and locations are designed to provide residence time to allow the larger sediment particles to settle out of suspension within the area being dredged. The silt curtain systems will be flexible and adaptable to both the environmental conditions of the river as well as all activities associated with dredging. These silt curtains will be constructed of PVC sheeting that is weighted on the bottom and suspended from marine-quality floatation buoys. They will have a drop which can be adjusted to prevent the silt curtain from dragging on the river bottom. Floating, flashing marker lights designed for use with turbidity control curtains will be installed.

2.2.1.2 Installation

The silt curtain/boom systems will be connected directly to the dredge plant and the material hopper barge such that at all times the dredging operations are conducted within the silt curtain system. In order to avoid having to "dig in" to install the silt curtain system at locations where the water depth is less than 3 ft, the silt curtain system will be secured with anchors.

The alignments of the silt curtain/boom systems will be established by the contractor, who will determine the locations of all the anchors taking into consideration the capabilities of dredge plant and tidal fluctuations. The silt curtain/boom systems will be loaded onto work boats and transported to the designated area. Once on station, the silt curtain/booms will be lowered into the water and anchored to either the marine vessels or anchors. The silt curtain will be placed just above the sediment floor, avoiding contact with the bottom. After dredging an area, the silt curtains are removed in the reverse order of installation prior to repositioning the dredge plant.

2.2.1 Operational Controls

In addition to the silt curtain system, the following Best Management Practices (BMP) will be employed during the dredging/capping operations:

- Monitor the river velocity and suspend operations the velocity increases above the effective velocity of a silt curtain system.
- Utilize a closed, watertight (i.e., environmental) clamshell.
- Maximize the size of the "bite" taken by the clamshell.
- Slowly withdrawing the clamshell through the very short water column.
- Prohibit barge overflow or rinsing sediment off the sides/gunwales of the barge.
- Maintain expeditious movement of the closed bucket to the receiving barge after completing a cut to reduce water leakage from the clamshell bucket into the river to the extent practicable.
- Prohibit "re-handling" or stockpiling of material on the river bottom.
- Prohibit raking for debris removal.
- Avoid grounding of marine vessels and allowing water levels to rise before attempting to free grounded vessels.

- Minimize the number of trips by support vessels.
- Restrict the draft of workboats and barges.
- Restrict navigational speeds.
- Restrict the size and power of workboats and restrict throttle speeds in the Removal Area.

Water Quality Monitoring

Dredging will be conducted in a manner that will minimize resuspension of dredged sediment in the Removal Area. The objectives of the dredge monitoring activities include the following:

- Monitor the water quality beyond the silt curtains for increased resuspension during dredging operations.
- Quantify select COPC levels in the water column during dredging operations.
- Compare water quality results to the extent practical with applicable NJ Surface Water Quality criteria
- Adjust operations as needed to achieve desired water quality during dredging.

New Jersey Administrative Code (NJAC) 7:14A, Surface Water Discharge Criteria, and NJAC 7:9B, Surface Water Quality Standards, have been identified as relevant and appropriate requirements. In particular, NJAC 7:14A-12, Effluent Standards Applicable to Direct Discharges to Surface Water and Indirect Discharges to Domestic Treatment Works, and NJAC 7:14A-13, Effluent Limitations for Discharge to Surface Water Permits, have been considered for 2,3,7,8TCDD, total PCB congeners and mercury. Since these parameters adhere to sediment, TSS and turbidity are appropriate for monitoring.

The target COPCs are 2,3,7,8 TCDD, Total PCB Congeners, and mercury. While there are specific surface water effluent standards for these compounds at remediation sites, COPC sampling data cannot be collected and analysed in a timeframe that will allow real-time management of dredging operations. TSS and turbidity provide suitable parameters to assess potential construction-related water quality changes, and were selected for water quality monitoring because they can be measured in real-time during the dredging/capping operations. To provide data associated with the COPCs, monitoring of COPCs will be conducted periodically. However, should an exceedance of the action level occur, additional water column sampling will be conducted outside the area of influence of the dredging/capping operations.

There are no specific numeric limits for TSS or turbidity in NJAC 7:14A-12 or NJAC 7:14A-13, therefore, trigger and action levels were established in the Draft Final Design considering the NJAC 7:9B surface water quality criteria for FW2-NT waters. These criteria for TSS and turbidity are 40 mg/L (maximum) and 15 NTU (30-day average), respectively. Surface water quality criteria for FW2-NT waters also sets a maximum for turbidity at 50 NTU. As indicated in Section 1.3, the water column monitoring data collected at RM 10.2 in 2009 and 2010 as part of the LPRSA RI/FS PWCM Program indicate that the average TSS concentration was 29 mg/L, with a standard deviation of 29 mg/L, and a maximum of 174 mg/L. The average turbidity was 20 NTU, with a standard deviation of 165 NTU and a maximum of 220 NTU. Because water quality in the area already exceeds on a regular basis the state water quality criteria, trigger/action values for the RM 10.9 project will be based on TSS and turbidity values that are detected at concentrations above these ambient conditions. Trigger and action levels specific to the RM 10.9 Removal Action are described in Section 4 of this WQMP.

Details regarding data quality objectives and analytical methods will be provided in an amended version of the RI Water Column Monitoring/Small Volume Chemical Data Collection QAPP (AECOM, 2011).

3.1 Turbidity Monitoring

3.1.1 Baseline Turbidity and TSS Monitoring

Turbidity monitoring has been used on other dredging projects as a real-time indicator of resuspension due to dredging and capping operations. A site-specific relationship between turbidity and TSS will be established for the RM 10.9 Removal Action using both historical and project specific data.

Data collected for the RI PWCM at RM 10.2 provides a preliminary indication that a relatively good correlation between turbidity and TSS exists. Surface water monitoring of turbidity (NTU) and TSS will be performed to collect data that will be used to determine the project specific turbidity to TSS correlation. Prior to the commencement of dredging activities, four stationary buoyed monitoring locations will be installed upstream and downstream of the RM 10.9 Removal Area to establish average non-dredging baseline conditions as well as measuring turbidity during dredging (**Figure 1**). The continuous monitoring locations will be positioned as follows:

1. Turbidity buoy #1: a fixed upstream "baseline" location approximately 3,300 ft upstream of the Removal Area operations
2. Turbidity buoy #2: approximately 200 ft upstream of the perimeter of the RM 10.9 Removal Area
3. Turbidity buoy #3: approximately 200 ft downstream of the perimeter of the RM 10.9 Removal Area
4. Turbidity buoy #4: a fixed downstream "baseline" location approximately 3,300 ft downstream of the Removal Area operations

Upstream and downstream baseline measurements for TSS and turbidity (turbidity buoys #1, #2, #3 and #4) will begin at least 1 month prior to dredging activities and cease after completion of capping operations.

The turbidity monitors will be installed at these locations at half the water depth (as measured at low tide) to collect data every 15 minutes for assessing turbidity levels. During the month of baseline monitoring, daily TSS samples will also be collected at the four buoy locations to verify and refine the historical turbidity–TSS relationship so that the real-time turbidity monitors can be the initial resuspension indicator.

3.1.1.1 Initial Dredging Monitoring

The turbidity–TSS relationship which will be provided as described in Section 1.3 will be the starting point for the water quality monitoring program. This correlation will be refined during the baseline monitoring and updated as required during the initial dredging operations. During the first 48 hours of dredging, TSS samples will be collected at the four buoy locations indicated in Section 3.1.1 as well at a fifth, operation early detection location placed as close as practical (approximately 50 feet) down current of the silt curtain system surrounding the dredging operations. During this initial phase of

monitoring, a two-person crew in a small vessel (e.g., a jon boat) will monitor the extent of the visible turbidity plume downstream of dredging activities using the same type of turbidity monitor used at the four stationary locations. TSS samples will be collected from mid-depth (as measured at low tide). Sampling will start at the dredge and continue at 100 ft intervals in the direction of current flow within the center of the visible suspended solid plume until the downstream point is reached where turbidity levels return to no more than 110 percent of current ambient levels as determined by turbidity buoys #1 and #4. Surface water TSS sample/turbidity monitoring locations will be surveyed via GPS and recorded. Turbidity correlation curves will be established upon collection of a minimum of 20 TSS samples collected over a range of turbidity levels using the method described above. These samples will be paired with the corresponding in-situ turbidity measurements to establish the dredging site-specific relationship between TSS and turbidity. Additional paired samples may be required based on the range of concentrations obtained and the correlation curve derived from the initial set of paired TSS/turbidity results.

Once established, the correlation curve will be used to estimate the TSS concentration from the measured turbidity value, and turbidity will be measured continually during dredging operations at the five monitoring locations described above. Confirmation of the TSS/turbidity relationship will be conducted at least once a month during the duration of the project by collecting water samples for TSS analysis from the water depth of greatest turbidity at three locations, starting at the dredge and continuing at 100 ft intervals, resulting in three samples per month.

The locations of the four fixed and the operational early detection monitoring sites are shown in **Figure 1**. **Table 1** provides an overview of the monitoring points. The farthest upstream and downstream monitoring sites (Buoys #1 and #4) are intended to reflect the ambient conditions of the LPR (depending on tidal and river stage conditions) and were placed such that they would not be affected by the dredging operations. The monitoring sites adjacent to the Removal Area (Buoys #2 and #3) are intended to reflect conditions due to the dredging and capping operations. The fifth location (Buoy #5) is intended to provide operational early detection of elevated turbidity levels and allow the project to make adjustments such that the trigger level is not exceeded.

3.1.1.2 Resuspension Monitoring

After the initial 48-hours of dredging monitoring for turbidity and TSS, resuspension monitoring will begin. This monitoring is performed by the real-time turbidity monitoring at the four buoy locations at 15-minute intervals. The following action levels will be implemented:

- If the turbidity "**trigger level**," or early warning criterion, of 35 NTU above ambient (determined at the upstream far field buoy depending on the tide) is exceeded over four consecutive readings (i.e., 60 minutes) at turbidity buoy #2 or #3, the dredging/capping operator will be notified and directed to evaluate dredging BMPs as identified in Section 2.2.1.
- If the turbidity "**action level**" of 70 NTU above ambient (determined at the upstream far field buoy depending on the tide) is exceeded over four consecutive readings (i.e., 60 minutes), at turbidity buoy #2 or #3, dredging/capping operations will be suspended until the turbidity level returns to below the 70 NTU above the ambient action level for four consecutive readings (i.e., 60 minutes),

unless it can be demonstrated through visual observations or the turbidity data trends of the monitoring buoys that dredging is not the cause of the exceedance.

- If dredging is suspended, a water column sample will be collected at the buoy location where the trigger level occurred for a maximum of three separate "action level" events during dredging, and will be analyzed for the target COPCs (2,3,7,8 TCDD, Total PCB Congeners, mercury).

In addition to the real-time turbidity monitoring, field measurements will be made of turbidity and TSS samples collected at turbidity buoys #2 and #3 and at a transect location that will include west, center, and east channel locations. These samples will be collected weekly and will be used as a check on real-time monitoring.

Table 1 Removal Action Surface Water Monitoring Details

Monitoring Location	Type of Monitoring Point	Monitoring Frequency	Description of Location
Turbidity buoy #1	Real time turbidity (NTU) TSS sample collection	Continuous—15 minute Baseline—once daily; initial 48 hrs—every 4 hrs; daily during dredging	Fixed point 3,300 ft upstream of Removal Area
Turbidity buoy #2	Real time turbidity (NTU) TSS sample collection COPC Samples	Continuous—15 minute Baseline—once daily; initial 48 hrs—every 4 hrs; daily during dredging Once a week	Maintain upstream of dredging operation 200 ft
Turbidity buoy #3	Real time turbidity (NTU) TSS sample collection COPC Samples	Continuous—15 minute Baseline—once daily; initial 48 hrs—every 4 hrs; daily during dredging Once a week	Maintain downstream of dredging operation 200 ft
Turbidity buoy #4	Real time turbidity (NTU) TSS sample collection	Continuous—15 minute Baseline—once daily; initial 48 hrs—every 4 hrs; daily during dredging	Fixed point 3,300 ft downstream of Removal Area
Turbidity buoy #5	Real time turbidity (NTU) Early detection location	Continuous—15 minute	Location approximately 50 ft down current of silt curtain system surrounding dredging/capping operations
River Mile 10.2	Field turbidity (NTU), TSS and COPC sample collection	Once a week	Same location utilized for RI Water Column Monitoring
Transects (west, center, east channels)	Field turbidity(NTU) and TSS sample collection	Once a week	Dredging project area—various locations
Trigger level buoy locations	Water column select COPCs and TSS sample collection	3 action level events during dredging	Dredging project area

3.1.2 Monitoring Frequency and Duration

Monitoring for the RM 10.9 Removal Action will occur for the duration of the dredging/capping operations at the frequency listed in Table 1.

3.1.3 Data Management and Response

The data recording and notification system involves the continuous downloading of turbidity results via telemetry to a central database. These results are then uploaded to a website which may be viewed by authorised users.

In the event that an exceedence of the trigger value is detected, or when equipment failure may be imminent (e.g. low battery), an alert is sent via SMS to the environmental team for actioning.

A water quality alert will initiate a response in accordance with the process outlined in **Section 4**.

3.2 Monitoring of Chemicals of Potential Concern (COPC)

3.2.1 COPC Monitoring Locations and Parameters

As discussed in **Section 3.1.1**, grab samples will be taken from a boat both upstream and downstream of the RM 10.9 Removal Area perimeter at Buoy Locations #2 and # 3 as well as the RM 10.2 location.

In addition to TSS and turbidity, the samples collected will be analyzed for a range of constituents, including:

- 2,3,7, 8 TCDD
- Total PCB Congeners(PCB)
- Mercury (total and dissolved)
- Total Organic Carbon(TOC)
- Dissolved Organic Carbon (DOC)
- Suspended Solids Concentration (SSC)
- Total Dissolved Solids (TDS)

Subject to the persistent non-detection or non-exceedances of any water quality criteria for analytes listed above during the water quality monitoring program, the agencies may agree in writing to amend the monitoring list.

3.2.2 Frequency of Sampling

Grab samples will be collected from the midpoint of the water column (as measured at low tide) on a weekly basis from Buoys #2 and #3 as well as the RM 10.2 location when dredging and capping operations are being conducted.

3.2.3 Sampling Methodology

Sample collection and laboratory analyses will be undertaken by appropriately qualified personnel in accordance with the relevant standards and quality assurance/quality control (QA/QC) protocols that will be described in an addendum or field modification to the RI Small Volume Chemical Water Column Monitoring QAPP (AECOM, 2011). In addition, during each monitoring round the necessary QA/QC sampling regime will be applied as specified in the QAPP.

3.2.4 Data Evaluation

Samples which are collected will be delivered to the laboratories on the same day where feasible, in accordance with the QAPP. An expedited turnaround time will be requested from the laboratories at the time of sample delivery, however, given the many external dependencies and inability of the laboratory to commit to a minimum turnaround period on results, this period cannot be guaranteed and will be subject to continual review.

Upon validation the analytical results will be entered into the water quality database as specified by data submission requirements of the LPRSA RI/FS. These data will be compared to ambient water quality results and established trigger values.

3.3 Additional Data Collection Requirements

3.3.1 Meteorological Conditions

The following additional information will be recorded in the water quality database and considered as necessary in the evaluation of data:

- Date, time and location of sampling;
- Person who collected the sample;
- Tidal information;
- Local wind speed and direction;
- Rainfall; and
- Other non-project river activities.

3.3.2 Visual Observations

Where a plume or sheen is observed emanating from the silt curtain deployed around the active dredging/capping operations, then specific measures will be taken to control the event, prevent further impact and take corrective measures in order to prevent potential for a recurrence (refer **Section 4.3**). This will include collection of samples for lab analyses.

Response

4.1 Trigger and Action Values

The event process described below will be implemented when water quality trigger values or action values are exceeded. The trigger and action levels for turbidity are as follows:

- Trigger Level – Ambient + 35 NTU
- Action Level - Ambient + 70 NTU
- Ambient levels as determined at the upstream far field buoy depending on the tide

4.2 Turbidity Exceedances and Initial Response

The construction manager will be notified if the measured turbidity exceeds the trigger/action values at any continuous monitoring location. This system measures continuously, and downloads the information every 15 minutes (maximum). The environmental representative will closely monitor the subsequent measurements. In the event that an exceedence is detected continuously for more than 1 hour, a management response will be initiated in accordance with **Section 4.3**.

4.3 Event Response Process

If a visible plume or sheen emanating from the silt curtain around the active dredging/capping area is detected and/or an exceedance of the trigger/action values is recorded continuously for more than 1 hour, then the response processes described below and summarized in Figure 2 will be initiated.

4.3.1 Exceedance of Turbidity Trigger Value

If turbidity is measured at or above the trigger value specified in Section 4.1, the dredging/capping operator will be notified of the event and the project's BMPs will be evaluated.

Should the cause of the increase be attributed to the RM 10.9 activities, then the project BMPs will be adjusted accordingly. Dredging/capping activities will not be stopped as a result of this exceedance.

The construction manager (or delegate) will be responsible for overseeing the process of investigation and determination of the appropriate mitigation and other corrective measures in consultation with on-site dmi and EPA personnel and other relevant on-site personnel.

The proposed measures will consider the significance of the increase and the impacts, if any, that the increased turbidity may be having on the River.

Details of the increased turbidity above the trgger value will be documented and will include, but not be limited to, the sampling location, time, date, tidal movements, meteorological conditions, location of dredging operations., and the corrective and other measures taken in response to the event. Where relevant, the details of other in-river activities unrelated to RM 10.9 Removal Action will be noted.

4.3.2 Exceedance of Turbidity Action Value

If the measured turbidity is at or above the Action Value specified in Section 4.1, the dredging/capping activities will be immediately suspended and the cause of the increased turbidity and appropriate corrective measures will be investigated. Suspended dredging/capping operations means these activities will stop completely.

If dredging is suspended, a water column sample will be collected at the buoy location where the Action level occurred for the target COPCs (2,3,7,8 TCDD, Total PCB Congeners, mercury).

The construction manager (or delegate) will be responsible for overseeing the process of investigation and determination of the appropriate mitigation and other corrective measures in consultation with on-site dmi and EPA personnel and other relevant on-site personnel. Notification to other off-site EPA and NJDEP personnel will be completed as provided in the Reporting section of this document.

Dredging/capping activities will resume only when:

1) It is established that all dredging/capping plant and equipment is operating in a proper and efficient manner; and
2) Appropriate corrective measures have been implemented (note: any modifications to the operation undertaken for the specific purpose of addressing the increase due to dredging must restore turbidity levels to below the action value within 30 minutes from the time of initiating the response; otherwise activities will remain suspended until this result is achieved).

If factors related to the RM 10.9 dredging activities are, or are likely to be, contributing to the triggered exceedances, then the corrective and/or contingencies measures identified in **Section 5** may be applied. The measures include undertaking further sampling and/or installation of additional silt curtains, absorbent booms and/or other operational modifications.

The proposed measures will consider the significance of the increase and the impacts that the increased turbidity may be having on the River.

Details that will be recorded in the event of an exceedence will include, but not be limited to, the sampling location, time, date, tidal movements, meteorological conditions, location of dredging operations and level of contaminants of concern (from grab samples following the event), and the corrective and other measures taken in response to the event. Where relevant, the details of other in-river activities unrelated to RM 10.9 Removal Action will be noted.

4.4 Reporting

Turbidity measurements above the action value for turbidity whether attributable to the RM 10.9 Removal Action activities or not, will be reported to USEPA and NJDEP within two working days of the results becoming known. This reporting will also include the management (response) measures taken at the time and the likely cause where RM 10.9 Removal Action activities were not found to have contributed to the turbidity.

Contingency Measures

A range of contingency measures are available to apply in response to turbidity measurements above the trigger/action values where found attributable to the RM 10.9 Removal Action dredging and capping activities. The implementation of any of these contingencies will be determined by the Construction Manager (or delegate) and the Environmental Representative (or delegate).

The nature and extent of the contingency measures adopted will be mindful of the regulatory compliance requirements and prevailing river conditions.

These measures may include:

- Additional river quality monitoring;
- Repairing, modifying and/or installing additional silt curtains;
- Repairing, modifying and/or installing absorbent booms;
- Modifying the dredging/capping operational parameters;
- Modifying the dredging/capping equipment, including bucket; and
- Modifying or suspending activities until river water quality is restored to below action values.

The written information will include the following:

- A description of the incident, its cause, and any contributing factors
- The exact dates and times of non-compliance
- If not yet corrected, the amount of time anticipated to correct the non-compliance
- Corrective actions taken or planned to prevent a recurrence

References

AECOM. (2011, August). Quality assurance Project Plan/Field Sampling Plan Addendum, Lower Passaic River Study Area, RI Water Column Monitoring/Small Volume Chemical Data Collection, Revision 2. Chelmsford, MA: AECOM, Inc. (AECOM)

Figures

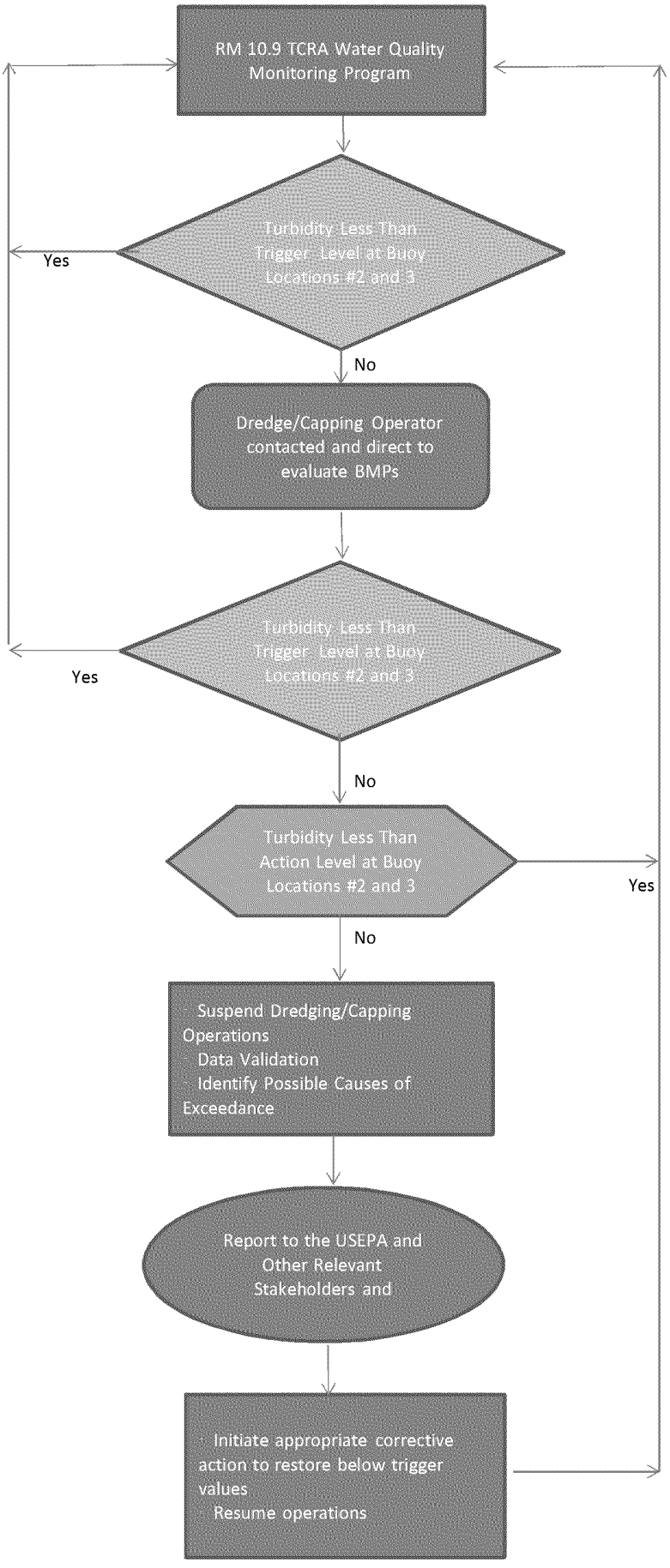

Figure 2. Water Quality Monitoring Decision Tree

Attachment 1

Summary Tables of LPRSA RI/FS Physical and Chemical Water Column Monitoring Data

Table 1
Summary of Analytical Results
RM 10.2 and RM 13.5
2009 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
09A-E01-T102-P1					
09A-E01-T102-P1-AS	10/12/09 11:56 AM			20	J
09A-E01-T102-P1-BS	10/12/09 11:59 AM			29	J
09A-E01-T135-P3					
09A-E01-T135-P3-AS	10/12/09 12:21 PM			5	J
09A-E01-T135-P3-BS	10/12/09 12:22 PM			9	J
09A-E03-T102-P1					
09A-E03-T102-P1-AS	10/13/09 8:35 AM	2.0	J	17	
09A-E03-T102-P1-BS	10/13/09 8:37 AM	1.9	J	21	
09A-E03-T102-P2					
09A-E03-T102-P2-AS	10/13/09 8:46 AM			19	
09A-E03-T102-P2-BS	10/13/09 8:48 AM			22	
09A-E03-T102-P3					
09A-E03-T102-P3-AS	10/13/09 8:53 AM			21	
09A-E03-T102-P3-BS	10/13/09 8:54 AM			23	
09A-E03-T135-P1					
09A-E03-T135-P1-AS	10/13/09 9:33 AM			5	
09A-E03-T135-P1-BS	10/13/09 9:34 AM			6	
09A-E03-T135-P2					
09A-E03-T135-P2-AS	10/13/09 9:41 AM			5	
09A-E03-T135-P2-BS	10/13/09 9:43 AM			6	
09A-E03-T135-P3					
09A-E03-T135-P3-AS	10/13/09 9:53 AM	1.4	J	6	
09A-E03-T135-P3-BS	10/13/09 9:55 AM	1.2	J	6	
09A-E04-T102-P1					
09A-E04-T102-P1-AS	10/13/09 1:36 PM	3.1	J	37	
09A-E04-T102-P1-BS	10/13/09 1:38 PM	4.0	J	82	
09A-E04-T102-P2					
09A-E04-T102-P2-AS	10/13/09 1:42 PM			36	
09A-E04-T102-P2-BS	10/13/09 1:44 PM			160	
09A-E04-T102-P3					
09A-E04-T102-P3-AS	10/13/09 1:55 PM			45	
09A-E04-T102-P3-BS	10/13/09 1:57 PM			56	
09A-E04-T135-P1					
09A-E04-T135-P1-AS	10/13/09 3:35 PM			7	
09A-E04-T135-P1-BS	10/13/09 3:37 PM			9	
09A-E04-T135-P2					
09A-E04-T135-P2-AS	10/13/09 3:40 PM			7	
09A-E04-T135-P2-BS	10/13/09 3:42 PM			11	
09A-E04-T135-P3					
09A-E04-T135-P3-AS	10/13/09 3:45 PM	1.3	J	7	
09A-E04-T135-P3-AT	10/13/09 3:45 PM			7	
09A-E04-T135-P3-BS	10/13/09 3:47 PM	1.4	J	8	
09A-E05-T102-P1					
09A-E05-T102-P1-AS	11/9/09 2:01 PM			11	
09A-E05-T102-P1-BS	11/9/09 2:02 PM			10	
09A-E05-T135-P3					
09A-E05-T135-P3-AS	11/10/09 11:30 AM			6	
09A-E05-T135-P3-BS	11/10/09 11:31 AM			8	
09A-E07-T102-P1					
09A-E07-T102-P1-AS	11/11/09 8:14 AM	< 0.8	U	20	
09A-E07-T102-P1-BS	11/11/09 8:16 AM	< 0.8	U	22	
09A-E07-T102-P1-BT	11/11/09 8:16 AM	< 0.8	U	21	

Table 1
Summary of Analytical Results
RM 10.2 and RM 13.5
2009 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
09A-E07-T102-P2					
09A-E07-T102-P2-AS	11/11/09 8:28 AM			21	
09A-E07-T102-P2-BS	11/11/09 8:31 AM			25	
09A-E07-T102-P3					
09A-E07-T102-P3-AS	11/11/09 8:38 AM			25	
09A-E07-T102-P3-BS	11/11/09 8:40 AM			27	
09A-E07-T135-P1					
09A-E07-T135-P1-AS	11/11/09 7:00 AM			8	
09A-E07-T135-P1-BS	11/11/09 7:02 AM			10	
09A-E07-T135-P2					
09A-E07-T135-P2-AS	11/11/09 7:11 AM			6	
09A-E07-T135-P2-BS	11/11/09 7:13 AM			7	
09A-E07-T135-P3					
09A-E07-T135-P3-AS	11/11/09 7:25 AM	< 1.2	U	7	J
09A-E07-T135-P3-BS	11/11/09 7:27 AM	< 1.5	U	10	J
09A-E08-T102-P1					
09A-E08-T102-P1-AS	11/11/09 1:26 PM	< 2.2	U	26	J
09A-E08-T102-P1-BS	11/11/09 1:27 PM	4.2		41	J
09A-E08-T102-P2					
09A-E08-T102-P2-AS	11/11/09 1:34 PM			21	J
09A-E08-T102-P2-BS	11/11/09 1:36 PM			48	J
09A-E08-T102-P3					
09A-E08-T102-P3-AS	11/11/09 1:42 PM			20	J
09A-E08-T102-P3-BS	11/11/09 1:44 PM			35	J
09A-E08-T135-P1					
09A-E08-T135-P1-AS	11/11/09 12:21 PM			6	J
09A-E08-T135-P1-BS	11/11/09 12:22 PM			7	J
09A-E08-T135-P2					
09A-E08-T135-P2-AS	11/11/09 12:28 PM			5	J
09A-E08-T135-P2-BS	11/11/09 12:30 PM			6	J
09A-E08-T135-P3					
09A-E08-T135-P3-AS	11/11/09 12:40 PM	< 0.8	U	5	J
09A-E08-T135-P3-BS	11/11/09 12:41 PM	< 0.9	U	7	J
09A-E09-T102-P1					
09A-E09-T102-P1-AS	11/9/09 3:52 PM			7	
09A-E09-T102-P1-BS	11/9/09 3:53 PM			10	
09A-E09-T135-P3					
09A-E09-T135-P3-AS	11/10/09 1:19 PM			6	
09A-E09-T135-P3-AT	11/10/09 1:20 PM			4	
09A-E09-T135-P3-BS	11/10/09 1:21 PM			6	
09A-E10-T102-P1					
09A-E10-T102-P1-AS	12/15/09 4:54 PM			14	
09A-E10-T102-P1-BS	12/15/09 4:55 PM			15	
09A-E10-T135-P3					
09A-E10-T135-P3-AS	12/15/09 3:17 PM			10	
09A-E10-T135-P3-AT	12/15/09 3:17 PM			11	
09A-E10-T135-P3-BS	12/15/09 3:19 PM			11	
09A-E12-T102-P1					
09A-E12-T102-P1-AS	12/14/09 3:52 PM	2.7	J	25	
09A-E12-T102-P1-BS	12/14/09 3:55 PM	3.1	J	27	
09A-E12-T102-P2					
09A-E12-T102-P2-AS	12/14/09 4:04 PM			27	
09A-E12-T102-P2-BS	12/14/09 4:05 PM			32	

Table 1
Summary of Analytical Results
RM 10.2 and RM 13.5
2009 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
09A-E12-T102-P3					
09A-E12-T102-P3-AS	12/14/09 4:13 PM			35	
09A-E12-T102-P3-BS	12/14/09 4:17 PM			42	
09A-E12-T135-P1					
09A-E12-T135-P1-AS	12/14/09 2:48 PM			15	
09A-E12-T135-P1-BS	12/14/09 2:49 PM			15	
09A-E12-T135-P2					
09A-E12-T135-P2-AS	12/14/09 2:59 PM			15	
09A-E12-T135-P2-BS	12/14/09 3:00 PM			18	
09A-E12-T135-P3					
09A-E12-T135-P3-AS	12/14/09 3:08 PM	2.2	J	16	
09A-E12-T135-P3-BS	12/14/09 3:10 PM	2.3	J	18	
09A-E13-T102-P1					
09A-E13-T102-P1-AS	12/14/09 9:34 PM	1.5	J	12	
09A-E13-T102-P1-BS	12/14/09 9:36 PM	1.5	J	13	
09A-E13-T102-P2					
09A-E13-T102-P2-AS	12/14/09 9:43 PM			11	
09A-E13-T102-P2-BS	12/14/09 9:45 PM			14	
09A-E13-T102-P3					
09A-E13-T102-P3-AS	12/14/09 9:54 PM			11	
09A-E13-T102-P3-BS	12/14/09 9:55 PM			14	
09A-E13-T102-P3-BT	12/14/09 9:55 PM			14	
09A-E13-T135-P1					
09A-E13-T135-P1-AS	12/14/09 8:38 PM			14	
09A-E13-T135-P1-BS	12/14/09 8:39 PM			14	
09A-E13-T135-P2					
09A-E13-T135-P2-AS	12/14/09 8:49 PM			14	
09A-E13-T135-P2-BS	12/14/09 8:51 PM			15	
09A-E13-T135-P3					
09A-E13-T135-P3-AS	12/14/09 8:57 PM	1.5	J	13	
09A-E13-T135-P3-BS	12/14/09 8:59 PM	1.6	J	15	

Notes:
1) J = Estimated Value
2) mg/l = milligrams per liter
3) Fraction D=dissolved, T=total, NA=Not Applicable
4) Validated Y = Yes, N = No

Table 2
Summary of Analytical Results
RM 10.2 and RM 13.5
2010 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
10A-E01-T102-P1					
10A-E01-T102-P1-AS	3/23/10 9:32 AM			45	J
10A-E01-T102-P1-BS	3/23/10 9:31 AM			52	J
10A-E01-T135-P3					
10A-E01-T135-P3-AS	3/24/10 10:06 AM			19	J
10A-E01-T135-P3-BS	3/24/10 10:04 AM			21	J
10A-E01-T135-P3-BT	3/24/10 10:04 AM			27	J
10A-E03-T102-P1					
10A-E03-T102-P1-AS	3/25/10 8:09 AM	1.5	J	11	J
10A-E03-T102-P1-AT	3/25/10 8:09 AM			11	J
10A-E03-T102-P1-BS	3/25/10 8:06 AM	1.5	J	12	J
10A-E03-T102-P2					
10A-E03-T102-P2-AS	3/25/10 8:19 AM			13	J
10A-E03-T102-P2-BS	3/25/10 8:18 AM			17	J
10A-E03-T102-P3					
10A-E03-T102-P3-AS	3/25/10 8:29 AM	1.5	J	13	J
10A-E03-T102-P3-BS	3/25/10 8:27 AM	2.0	J	13	J
10A-E03-T135-P1					
10A-E03-T135-P1-AS	3/25/10 7:31 AM	1.2	J	10	J
10A-E03-T135-P1-BS	3/25/10 7:29 AM	1.4	J	10	J
10A-E03-T135-P2					
10A-E03-T135-P2-AS	3/25/10 7:19 AM			10	J
10A-E03-T135-P2-BS	3/25/10 7:17 AM			10	J
10A-E03-T135-P3					
10A-E03-T135-P3-AS	3/25/10 7:09 AM	1.4	J	10	J
10A-E03-T135-P3-BS	3/25/10 7:06 AM	1.6	J	10	J
10A-E04-T102-P1					
10A-E04-T102-P1-AS	3/25/10 2:18 PM	1.4	J	13	J
10A-E04-T102-P1-AT	3/25/10 2:19 PM			13	J
10A-E04-T102-P1-BS	3/25/10 2:16 PM	1.0	J	18	J
10A-E04-T102-P2					
10A-E04-T102-P2-AS	3/25/10 2:28 PM			14	J
10A-E04-T102-P2-BS	3/25/10 2:27 PM			11	J
10A-E04-T102-P2-BT	3/25/10 2:27 PM			11	J
10A-E04-T102-P3					
10A-E04-T102-P3-AS	3/25/10 2:28 PM	1.5	J	12	J
10A-E04-T102-P3-BS	3/25/10 2:27 PM	1.5	J	13	J
10A-E04-T135-P1					
10A-E04-T135-P1-AS	3/25/10 1:06 PM	1.3		11	J
10A-E04-T135-P1-BS	3/25/10 1:04 PM	1.5		19	J
10A-E04-T135-P2					
10A-E04-T135-P2-AS	3/25/10 1:15 PM			12	J
10A-E04-T135-P2-BS	3/25/10 1:13 PM			10	J
10A-E04-T135-P3					
10A-E04-T135-P3-AS	3/25/10 1:25 PM	1.4		11	J
10A-E04-T135-P3-BS	3/25/10 1:22 PM	1.8		10	J
10A-E05-T102-P1					
10A-E05-T102-P1-AS	5/1/10 12:16 AM			5	
10A-E05-T102-P1-BS	5/1/10 12:14 AM			7	
10A-E05-T135-P3					
10A-E05-T135-P3-AS	5/1/10 9:58 AM			7	
10A-E05-T135-P3-BS	5/1/10 9:57 AM			< 1	U
10A-E07-T102-P1					
10A-E07-T102-P1-AS	5/3/10 9:48 AM	3.9	J	40	J
10A-E07-T102-P1-BS	5/3/10 9:45 AM	7.9	J	60	J

Table 2
Summary of Analytical Results
RM 10.2 and RM 13.5
2010 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
10A-E07-T102-P2					
10A-E07-T102-P2-AS	5/3/10 9:56 AM			27	J
10A-E07-T102-P2-BS	5/3/10 9:55 AM			30	J
10A-E07-T102-P3					
10A-E07-T102-P3-AS	5/3/10 10:05 AM	3.1	J	31	J
10A-E07-T102-P3-BS	5/3/10 10:02 AM	5.6	J	39	J
10A-E07-T135-P1					
10A-E07-T135-P1-AS	5/3/10 8:43 AM	4.8	J	27	J
10A-E07-T135-P1-BS	5/3/10 8:42 AM	7.5	J	61	J
10A-E07-T135-P2					
10A-E07-T135-P2-AS	5/3/10 8:56 AM			29	J
10A-E07-T135-P2-BS	5/3/10 8:55 AM			80	J
10A-E07-T135-P3					
10A-E07-T135-P3-AS	5/3/10 9:08 AM	5.0	J	30	J
10A-E07-T135-P3-AT	5/3/10 9:08 AM			24	J
10A-E07-T135-P3-BS	5/3/10 9:06 AM	7.1	J	51	J
10A-E08-T102-P1					
10A-E08-T102-P1-AS	5/3/10 3:07 PM	2.7	J	15	J
10A-E08-T102-P1-BS	5/3/10 3:03 PM	3.2	J	18	J
10A-E08-T102-P2					
10A-E08-T102-P2-AS	5/3/10 3:14 PM			16	J
10A-E08-T102-P2-AT	5/3/10 3:15 PM			16	J
10A-E08-T102-P2-BS	5/3/10 3:13 PM			15	J
10A-E08-T102-P3					
10A-E08-T102-P3-AS	5/3/10 3:29 PM	4.4	J	26	J
10A-E08-T102-P3-BS	5/3/10 3:26 PM	6.5	J	15	J
10A-E08-T135-P1					
10A-E08-T135-P1-AS	5/3/10 2:17 PM	2.6	J	15	J
10A-E08-T135-P1-BS	5/3/10 2:14 PM	4.6	J	29	J
10A-E08-T135-P2					
10A-E08-T135-P2-AS	5/3/10 2:26 PM			57	J
10A-E08-T135-P2-BS	5/3/10 2:25 PM			20	J
10A-E08-T135-P3					
10A-E08-T135-P3-AS	5/3/10 2:34 PM	2.4	J	14	J
10A-E08-T135-P3-BS	5/3/10 2:32 PM	3.8	J	16	J
10A-E09-T102-P1					
10A-E09-T102-P1-AS	5/1/10 2:01 PM			10	
10A-E09-T102-P1-BS	5/1/10 1:59 PM			6	
10A-E09-T102-P1-BT	5/1/10 1:59 PM			8	
10A-E09-T135-P3					
10A-E09-T135-P3-AS	5/1/10 11:53 AM			7	
10A-E09-T135-P3-BS	5/1/10 11:51 AM			5	
10A-E10-T102-P1					
10A-E10-T102-P1-AS	5/19/10 12:53 AM			9	J
10A-E10-T102-P1-BS	5/19/10 12:52 AM			10	J
10A-E10-T135-P3					
10A-E10-T135-P3-AS	5/19/10 10:12 AM			9	J
10A-E10-T135-P3-BS	5/19/10 10:11 AM			8	J
10A-E12-T102-P1					
10A-E12-T102-P1-AS	5/24/10 8:28 AM	2.2	J	8	J
10A-E12-T102-P1-BS	5/24/10 8:26 AM	2.4	J	11	J
10A-E13-T102-P1-AS	5/24/10 2:46 PM	1.3		8	J
10A-E13-T102-P1-AT	5/24/10 2:47 PM			14	J
10A-E13-T102-P1-BS	5/24/10 2:44 PM	1.4		7	J

Table 2
Summary of Analytical Results
RM 10.2 and RM 13.5
2010 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
10A-E12-T102-P2					
10A-E12-T102-P2-AS	5/24/10 8:36 AM			10	J
10A-E12-T102-P2-BS	5/24/10 8:34 AM			10	J
10A-E13-T102-P2-AS	5/24/10 2:51 PM			8	J
10A-E13-T102-P2-BS	5/24/10 2:50 PM			8	J
10A-E12-T102-P3					
10A-E12-T102-P3-AS	5/24/10 8:43 AM	2.6	J	12	J
10A-E12-T102-P3-BS	5/24/10 8:41 AM	2.7	J	16	J
10A-E13-T102-P3-AS	5/24/10 2:56 PM	1.4		10	J
10A-E13-T102-P3-BS	5/24/10 2:54 PM	2.6		10	J
10A-E12-T135-P1					
10A-E12-T135-P1-AS	5/24/10 7:27 AM	1.9		5	J
10A-E12-T135-P1-BS	5/24/10 7:26 AM	1.8		8	J
10A-E13-T135-P1-AS	5/24/10 2:00 PM	1.5		5	J
10A-E13-T135-P1-BS	5/24/10 1:58 PM	1.7		7	J
10A-E12-T135-P2					
10A-E12-T135-P2-AS	5/24/10 7:34 AM			5	J
10A-E12-T135-P2-BS	5/24/10 7:33 AM			6	J
10A-E13-T135-P2-AS	5/24/10 2:07 PM			7	J
10A-E13-T135-P2-BS	5/24/10 2:06 PM			7	J
10A-E12-T135-P3					
10A-E12-T135-P3-AS	5/24/10 7:43 AM	2.0		7	J
10A-E12-T135-P3-BS	5/24/10 7:40 AM	2.0		9	J
10A-E13-T135-P3-AS	5/24/10 2:12 PM	1.2		6	J
10A-E13-T135-P3-BS	5/24/10 2:11 PM	1.3		8	J
10A-E14-T102-P1					
10A-E14-T102-P1-AS	5/19/10 2:40 PM			7	J
10A-E14-T102-P1-BS	5/19/10 2:38 PM			30	J
10A-E14-T135-P3					
10A-E14-T135-P3-AS	5/19/10 12:17 AM			7	J
10A-E14-T135-P3-AT	5/19/10 12:17 AM			6	J
10A-E14-T135-P3-BS	5/19/10 12:16 AM			15	J
10A-E15-T102-P1					
10A-E15-T102-P1-AS	6/17/10 12:16 AM			45	J
10A-E15-T102-P1-BS	6/17/10 12:15 AM			27	J
10A-E15-T135-P3					
10A-E15-T135-P3-AS	6/17/10 9:28 AM			15	J
10A-E15-T135-P3-BS	6/17/10 9:27 AM			17	J
10A-E17-T102-P1					
10A-E17-T102-P1-AS	6/22/10 7:56 AM	4.4		34	J
10A-E17-T102-P1-BS	6/22/10 7:54 AM	6.2		46	J
10A-E17-T102-P2					
10A-E17-T102-P2-AS	6/22/2010			34	J
10A-E17-T102-P2-BS	6/22/2010			33	J
10A-E17-T102-P3					
10A-E17-T102-P3-AS	6/22/2010	4.9		36	J
10A-E17-T102-P3-BS	6/22/2010	5.2	J	39	J
10A-E17-T102-P3-BT	6/22/2010			38	J
10A-E17-T135-P1					
10A-E17-T135-P1-AS	6/22/2010	3.8		17	J
10A-E17-T135-P1-BS	6/22/2010	4.5		27	J
10A-E17-T135-P2					
10A-E17-T135-P2-AS	6/22/2010			16	J
10A-E17-T135-P2-BS	6/22/2010			27	J

Table 2
Summary of Analytical Results
RM 10.2 and RM 13.5
2010 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
10A-E17-T135-P3					
10A-E17-T135-P3-AS	6/22/2010	3.4		18	J
10A-E17-T135-P3-BS	6/22/2010	4.1		25	J
10A-E18-T102-P1					
10A-E18-T102-P1-AS	6/22/2010	6.7		57	J
10A-E18-T102-P1-BS	6/22/2010	11.6		105	J
10A-E18-T102-P2					
10A-E18-T102-P2-AS	6/22/2010			43	J
10A-E18-T102-P2-BS	6/22/2010			82	J
10A-E18-T102-P3					
10A-E18-T102-P3-AS	6/22/2010	4.4		35	J
10A-E18-T102-P3-BS	6/22/2010	7.5		82	J
10A-E18-T135-P1					
10A-E18-T135-P1-AS	6/22/2010	3.0		18	J
10A-E18-T135-P1-BS	6/22/2010	4.2		20	J
10A-E18-T135-P2					
10A-E18-T135-P2-AS	6/22/2010			13	J
10A-E18-T135-P2-BS	6/22/2010			14	J
10A-E18-T135-P3					
10A-E18-T135-P3-AS	6/22/2010	4.2		13	J
10A-E18-T135-P3-BS	6/22/2010	4.2		20	J
10A-E19-T102-P1					
10A-E19-T102-P1-AS	6/17/2010			22	J
10A-E19-T102-P1-BS	6/17/2010			22	J
10A-E19-T135-P3					
10A-E19-T135-P3-AS	6/17/2010			20	J
10A-E19-T135-P3-BS	6/17/2010			14	J
10A-E19-T135-P3-BT	6/17/2010			18	J
10A-E21-T102-P1					
10A-E21-T102-P1-AS	7/21/2010	3.4		18	J
10A-E21-T102-P1-BS	7/21/2010	3.4		19	J
10A-E21-T102-P2					
10A-E21-T102-P2-AS	7/21/2010			18	J
10A-E21-T102-P2-BS	7/21/2010			22	J
10A-E21-T102-P2-BT	7/21/2010			25	
10A-E21-T102-P3					
10A-E21-T102-P3-AS	7/21/2010	3.5		18	J
10A-E21-T102-P3-BS	7/21/2010	4.1		29	J
10A-E21-T135-P1					
10A-E21-T135-P1-AS	7/21/2010	2.8		9	J
10A-E21-T135-P1-BS	7/21/2010	2.5	J	9	
10A-E21-T135-P2					
10A-E21-T135-P2-AS	7/21/2010			9	J
10A-E21-T135-P2-BS	7/21/2010			12	J
10A-E21-T135-P3					
10A-E21-T135-P3-AS	7/21/2010	2.9	J	9	
10A-E21-T135-P3-BS	7/21/2010	2.6		11	J
10A-E22-T102-P1					
10A-E22-T102-P1-AS	7/21/2010	3.6		37	J
10A-E22-T102-P1-BS	7/21/2010	9.2	J	104	J
10A-E22-T102-P1-BT	7/21/2010	7.4	J	97	J
10A-E22-T102-P2					
10A-E22-T102-P2-AS	7/21/2010			28	J
10A-E22-T102-P2-BS	7/21/2010			51	J

Table 2
Summary of Analytical Results
RM 10.2 and RM 13.5
2010 Physical Water Column Monitoring

	Analyte	Particulate Organic Carbon		Suspended Solids Concentration (1.2um)	
	Unit	mg/l		mg/l	
	Fraction	NA		NA	
	Validated	Y		Y	
	Date	Result	Qual	Result	Qual
10A-E22-T102-P3					
10A-E22-T102-P3-AS	7/21/2010	3.5		44	J
10A-E22-T102-P3-BS	7/21/2010	5		48	J
10A-E22-T135-P1					
10A-E22-T135-P1-AS	7/21/2010	3.7		7	J
10A-E22-T135-P1-AT	7/21/2010	3.4		6	J
10A-E22-T135-P1-BS	7/21/2010	2.5		9	J
10A-E22-T135-P2					
10A-E22-T135-P2-AS	7/21/2010			7	J
10A-E22-T135-P2-BS	7/21/2010			6	J
10A-E22-T135-P3					
10A-E22-T135-P3-AS	7/21/2010	3.7	0	9	J
10A-E22-T135-P3-BS	7/21/2010	2.1		7	J
10A-E22-T135-P3-BT	7/21/2010			7	J
10A-E23-T102-P1					
10A-E23-T102-P1-AS	7/23/2010			26	J
10A-E23-T102-P1-BS	7/23/2010			33	J
10A-E23-T135-P3					
10A-E23-T135-P3-AS	7/23/2010			9	J
10A-E23-T135-P3-BS	7/23/2010			19	J

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) mg/l = milligrams per liter
4) Fraction D=dissolved, T=total, NA=Not Applicable
5) Validated Y = Yes, N = No

Table 3
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 1

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		N		Y	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
11A-CE01-T102																	
11A-CE01-T102-AS	Low	2620	8/16/11 5:35 AM	2.6		2.96	EMPC-J	2.66		51.5		15.4		28.8		< 5.79	U
11A-CE01-T102-BS	Low	2590	8/16/11 4:47 AM	4.8		5.38		5.39		91.5		22.6		45.3		9.96	EMPC-J
11A-CE02-T102																	
11A-CE02-T102-AS	Flood	2410	8/16/11 8:50 AM	1.5		3.71	EMPC-J	10.6		27.2		8.67		14.6		< 5.97	U
11A-CE02-T102-BS	Flood	2410	8/16/11 7:49 AM	2.8		6.54		55.9		3.09		16.5		23.8		< 10.9	U
11A-CE03-T102																	
11A-CE03-T102-AS	High	2470	8/16/11 11:59 AM	1.4		3.2	EMPC-J	2.98		32.0		7.91		18.8		< 5.66	U
11A-CE03-T102-BS	High	2440	8/16/11 11:11 AM	1.9		4.1	J	1.97		33.9		11.4		22.2		< 6.97	U
11A-CE04-T102																	
11A-CE04-T102-AS	Ebb	2530	8/16/11 2:48 PM	4		5.78		2.33		69.3		20.3		43.2		10.3	
11A-CE04-T102-BS	Ebb	2530	8/16/11 2:06 PM	3.9		6.92		1.82		84.6		25.8		50.1		12	

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 4
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 2

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		Y		Y	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12B-CE01-T102																	
12B-CE01-T102-AS	Low	681	2/20/12 1:50 PM	< 1.3	U	< 0.896	U	0.84		5.89		1.96		2.7	J	< 3.45	U
12B-CE01-T102-BS	Low	699	2/20/12 1:21 PM	< 1.3	U	< 0.91	U	0.86		5.31		2.05		3.7	J	< 1.97	U
12B-CE02-T102																	
12B-CE02-T102-AS	Flood	717	2/20/12 4:36 AM	< 1.3	U	1.33	EMPC-J	1.33		8.70		4.24		4.3	J	3.94	EMPC-J
12B-CE02-T102-BS	Flood	717	2/20/12 4:11 AM	< 1.3	U	1.51	EMPC-J	0.71		8.29		3.50		3.7	J	4.98	EMPC-J
12B-CE03-T102																	
12B-CE03-T102-AS	High	717	2/20/12 7:28 AM	< 1.3	U	1.37	EMPC-J	2.06		12.2		5.26		5.1	J	2.91	EMPC-J
12B-CE03-T102-BS	High	699	2/20/12 6:46 AM	< 1.3	U	3.1	J	1.62		21.3		6.58		7.0	J	4.94	
12B-CE03-T102-BT	High	699	2/20/12 6:46 AM	1.5		3.01	J	1.42		17.6		6.49		6.2	J	5.26	EMPC-J
12B-CE04-T102																	
12B-CE04-T102-AS	Ebb	736	2/20/12 10:27 AM	< 1.3	U	1.12	EMPC-J	0.81		10.9		3.39		4.8	J	3.82	EMPC-J
12B-CE04-T102-BS	Ebb	699	2/20/12 10:01 AM	< 1.3	U	1.36	EMPC-J	2.99		14.3		4.67		5.7	J	3.97	EMPC-J

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 5
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 3

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		p
			Fraction	NA		NA		D		T		NA		NA		N
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		Y		
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result
12D-CE01-T102																
12D-CE01-T102-AS	Low	421	3/26/12 6:19 AM	2.4	J	2.1	EMPC-J	1.43	J	25.8		8.02		15.2	J	< 3.33
12D-CE01-T102-BS	Low	421	3/26/12 5:39 AM	2.5	J	4.73	J	1.97	J	32.6		8.24		59.7	J	8.82
12D-CE02-T102																
12D-CE02-T102-AS	Flood	436	3/26/12 9:20 AM	3.5	J	< 1.55	U	11.1		58.9		17.0		55.5	J	< 1.55
12D-CE02-T102-BS	Flood	436	3/26/12 8:34 AM	4.6	J	3.48	EMPC-J	1.33	J	121		29.4		60.0	J	< 4.5
12D-CE03-T102																
12D-CE03-T102-AS	High	392	3/26/12 12:00 PM	2.6	J	3.82	EMPC-J	1.11	J	58.8		10.7		21.3	J	6.69
12D-CE03-T102-BS	High	392	3/26/12 11:19 AM	2.8	J	3.79	EMPC-J	0.75	J	34.2		11.6		21.9	J	6.79
12D-CE04-T102																
12D-CE04-T102-AS	Ebb	421	3/26/12 3:03 AM	3.4	J	3.03	J	2.35	J	67.2		15.9		29.3	J	< 5.13
12D-CE04-T102-BS	Ebb	421	3/26/12 2:16 AM	2.9	J	3.05	EMPC-J	18.6		48.0		18.2		26.5	J	< 5.73

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 5
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 3

			Analyte	TCDD
			Unit	g/l
			Fraction	NA
	Tide Stage	Dundee Dam	Validated	Y
		Flow (cfs)	Date	Qual
12D-CE01-T102				
12D-CE01-T102-AS	Low	421	3/26/12 6:19 AM	U
12D-CE01-T102-BS	Low	421	3/26/12 5:39 AM	
12D-CE02-T102				
12D-CE02-T102-AS	Flood	436	3/26/12 9:20 AM	U
12D-CE02-T102-BS	Flood	436	3/26/12 8:34 AM	U
12D-CE03-T102				
12D-CE03-T102-AS	High	392	3/26/12 12:00 PM	EMPC-J
12D-CE03-T102-BS	High	392	3/26/12 11:19 AM	EMPC-J
12D-CE04-T102				
12D-CE04-T102-AS	Ebb	421	3/26/12 3:03 AM	U
12D-CE04-T102-BS	Ebb	421	3/26/12 2:16 AM	U

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 6
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 4

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		Y		Y	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12F-CE01-T102																	
12F-CE01-T102-AS	Low	1160	6/4/12 3:28 AM	2.6		4.15	J	2.02		49.2		18.1		30.4		7.74	EMPC-J
12F-CE01-T102-BS	Low	1180	6/4/12 2:59 AM	2.7		6.4		5.38		65.3		16.8		41.1		10.1	EMPC-J
12F-CE02-T102																	
12F-CE02-T102-AS	Flood	1180	6/4/12 6:00 AM	3.1		11.7		1.29		83.2		18.2		31.7		14.9	EMPC-J
12F-CE02-T102-BS	Flood	1180	6/4/12 5:37 AM	4.6		14.1		4.48		95.7		28.9		50.6		20.9	EMPC-J
12F-CE03-T102																	
12F-CE03-T102-AS	High	1180	6/4/12 8:48 AM	1.4		6.12		1.24		42.6		13.8		13.3		8.64	
12F-CE03-T102-BS	High	1200	6/4/12 8:24 AM	1.7		6.99		1.15		54.5		18.1		16.2		10.2	
12F-CE04-T102																	
12F-CE04-T102-AS	Ebb	1360	6/4/12 12:07 PM	2.8		11.5		1.42		55.9		18.3		28.6		17	EMPC-J
12F-CE04-T102-BS	Ebb	1340	6/4/12 11:43 AM	2.2		6.65		3.92		53.2		19.7		23.6		10.2	EMPC-J

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 7
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Low Flow

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		Y		Y	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12G-CE01-T102																	
12G-CE01-T102-AS	Low	221	8/30/12 3:49 PM	1.7		7.84		5.82		67.3		28.7		31.9		9.9	EMPC-J
12G-CE01-T102-BS	Low	221	8/30/12 2:20 PM	3		1.2	EMPC-J	2.02		75.3		26.7		30.8		< 2.89	U
12G-CE02-T102																	
12G-CE02-T102-AS	Flood	210	8/30/12 6:09 PM	5.4		14.8		19.3		214		55.5		76.5		20.6	
12G-CE02-T102-BS	Flood	210	8/30/12 5:26 PM	11.2		49.8		1.91		330		183		153		67.5	EMPC-J
12G-CE03-T102																	
12G-CE03-T102-AS	High	210	8/30/12 8:35 PM	1.4		2.02	J	3.11		32.1		15.3		16.9		< 8.41	U
12G-CE03-T102-BS	High	210	8/30/12 7:55 PM	1.7		1.99	J	5.77		67.9		18.6		23.3		< 3.21	U
12G-CE04-T102																	
12G-CE04-T102-AS	Ebb	200	8/30/12 11:27 PM	2.8		21.1		20.6		53.9		39.2		32.0		28	EMPC-J
12G-CE04-T102-BS	Ebb	200	8/30/12 10:55 PM	2.7		81.3		7.72		45.6		25.8		29.1		89.1	EMPC-J

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 8
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring Survey 5

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	Y		Y		Y		Y		Y		N		Y	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12H-CE01-T102																	
12H-CE01-T102-AS	Low	681	12/10/12 12:08 PM	2.4		1.34	J	16.0		21.7		8.66		10.3		< 3.04	U
12H-CE01-T102-BS	Low	681	12/10/12 11:30 AM	2.5		3.19	J	1.11		35.5		12.9		14.8		< 5.57	U
12H-CE02-T102																	
12H-CE02-T102-AS	Flood	646	12/10/12 2:35 PM	3.7		53.7		4.24		58.2		25.9		33.4		86	EMPC-J
12H-CE02-T102-BS	Flood	664	12/10/12 2:03 PM	3.8		14.7		13.8		65.2		34.6		42.8		21.8	
12H-CE03-T102																	
12H-CE03-T102-AS	High	699	12/10/12 5:22 AM	1.6		2.55	EMPC-J	4.71		19.3		11.0		8.90		< 7.07	U
12H-CE03-T102-BS	High	699	12/10/12 4:38 AM	2.5		3.54	EMPC-J	7.02		24.8		12.0		12.1		< 6.25	U
12H-CE04-T102																	
12H-CE04-T102-AS	Ebb	681	12/10/12 8:52 AM	3.1		12.3		1.01		56.1		21.3		36.1		19.7	EMPC-J
12H-CE04-T102-BS	Ebb	681	12/10/12 8:03 AM	2.9		8.58	EMPC-J	1.31		35.4		21.5		30.6		16.8	EMPC-J

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 9
Summary of Analytical Results
RM10.2
Chemical Water Column Monitoring High Flow 1

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD		Mercury		Mercury		PCB, TOTAL		Suspended Solids Concentration (0.7um)		Total TCDD	
			Unit	mg/l		pg/l		ng/l		ng/l		ng/l		mg/l		pg/l	
			Fraction	NA		NA		D		T		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	N		N		N		N		N		N		N	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12C-CE11-T102																	
12C-CE11-T102-AS	ebb	2930	2/27/13 1:05 PM	3		3.2		2.53		27.0		24.7		pending		10.9	
12C-CE11-T102-BS	ebb	2930	2/27/13 10:27 AM	2		1.77		3.69		13.1		10.3		pending		2.86	
12C-CE12-T102																	
12C-CE12-T102-AS	flood	2830	2/27/13 9:12 PM	1.7		< 0.767		1.61		8.60		5.18		10.4		< 0.767	
12C-CE12-T102-BS	flood	2830	2/27/13 8:16 PM	1.8		< 1.67		2.05		12.2		5.35		10.2		< 1.67	
12C-CE20-T102																	
12C-CE20-T102-AS	ebb	3050	2/28/13 2:05 PM	2.7		2.29		2.37		21.8		8.54		25.5		3.62	
12C-CE20-T102-BS	ebb	3020	2/28/13 1:17 PM	2.3		2.12		2.62		24.5		6.83		24.7		5.03	
12C-CE21-T102																	
12C-CE21-T102-AS	flood	2160	3/4/13 10:00 AM	0.9	J	< 0.931		1.99		5.79		3.96		4.60		< 0.931	
12C-CE21-T102-BS	flood	2180	3/4/13 9:08 AM	1.1	J	< 1.85		1.13		7.57		14.2		5.8		< 1.85	

Notes:
1) U or < = Non-detect at laboratory detection limit
2) J = Estimated Value
3) EMPC-J = denotes Estimated Maximum Possible Concentration
4) mg/l = milligrams per liter
5) ng/l = nanograms per liter
6) pg/l = picograms per liter
7) Fraction D=dissolved, T=total, NA=Not Applicable
8) Validated Y = Yes, N = No
9) cfs = cubic feet per second

Table 10
Summary of Analytical Results
RM10.2
High-volume CWCM Survey 1

			Analyte	Particulate Organic Carbon		2,3,7,8-TCDD as whole water		PCB, TOTAL as whole water		Suspended Solids Concentration (0.7um)	
			Unit	mg/l		pg/l		pg/l		mg/l	
			Fraction	NA		NA		NA		NA	
	Tide Stage	Dundee Dam	Validated	N		N		N		N	
		Flow (cfs)	Date	Result	Qual	Result	Qual	Result	Qual	Result	Qual
12l-CE05-T102											
12l-CE05-T102-BE01	ebb	513	12/17/12 3:24 PM			5.115		23378			
12l-CE05-T102-BM01	ebb	513	12/17/12 3:24 PM								
12l-CE05-T102-BM02	ebb	513	12/17/12 3:24 PM								
12l-CE05-T102-BP01	ebb	513	12/17/12 3:24 PM								
12l-CE05-T102-BW01	ebb	513	12/17/12 3:24 PM	2.4						23.0	
12l-CE05-T102-BW02	ebb	513	12/17/12 3:24 PM	2.4						27.4	
12l-CE05-T102-BW03	ebb	513	12/17/12 3:24 PM	2.4						27.4	
12l-CE05-T102-BW04	ebb	513	12/17/12 3:24 PM	2.6						35.1	

Notes:
1) mg/l = milligrams per liter
2) pg/l = picograms per liter
3) Fraction D=dissolved, T=total, NA=Not Applicable
4) Validated Y = Yes, N = No
5) Whole water results are calculated.
6) cfs = cubic feet per second

Table 10
Summary of Analytical Results
RM10.2
High-volume CWCM Survey 1

			Analyte	Total TCDD as whole water	
			Unit	pg/l	
			Fraction	NA	
	Tide Stage	Dundee Dam	Validated	N	
		Flow (cfs)	Date	Result	Qual
12l-CE05-T102					
12l-CE05-T102-BE01	ebb	513	12/17/12 3:24 PM	7.958	
12l-CE05-T102-BM01	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BM02	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BP01	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BW01	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BW02	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BW03	ebb	513	12/17/12 3:24 PM		
12l-CE05-T102-BW04	ebb	513	12/17/12 3:24 PM		

Notes:
1) mg/l = milligrams per liter
2) pg/l = picograms per liter
3) Fraction D=dissolved, T=total, NA=Not Applicable
4) Validated Y = Yes, N = No
5) Whole water results are calculated.
6) cfs = cubic feet per second

Addendum 3: Specification and Typical Planned Placement for Silt Curtains

Silt Curtain System

The dredging/capping contractor will have a floating frame ("Moon Pool") attached to the pontoon to which a silt curtain will be fitted. Final configuration and anchoring will be provided by the Subcontractor as part of their Dredging and Operations Plan. The silt curtain will be specifically designed, manufactured and installed by an external contractor specializing in environmental sediment control in accordance with Technical Specification Section 31 23 24 – Dredging and Delivery.

The silt curtain attached to the floating frame will have a drop which can be adjusted to prevent the silt curtain from dragging on the river bottom. It will serve to contain any suspended material and re-direct it toward the bottom thus minimizing the migration of suspend solids.

Oil absorbing booms will also be fitted at either end where the frame attaches to the pontoon. This allows the frame to also act as an oil boom and confine any unexpected spills.

The photo below shows the floating frame attached to the pontoon with a silt curtain system fitted. An excerpt from Section 31 23 24 – Dredging and Delivery indicating the applicable silt curtain requirements is provided as Attachment 1. Typical details of a Moon Pool construction and a schematic of the layout are provided as Attachments 2 and 3, respectively.

Attachment #1

Silt Curtain Technical Specification

Excerpt from Technical Specification Section 31 23 24 – Dredging and Delivery (February 25, 2013) with respect to silt curtain system:

2.04 SILT CURTAINS

A. The dredge plant(s) shall be enclosed with a silt curtain/boom system in order to minimize turbidity and control unexpected spills.

B. The silt curtain systems shall be installed and maintained as indicated in the accepted Dredging and Operation Plan. CH2M HILL maintains the right to inspect the silt curtain installation/maintenance and direct changes as necessary.

C. The Subcontractor shall maintain the silt curtain/boom systems and associated markings/lighting in good and effective operating condition by performing daily inspections to determine condition and effectiveness, by repairing resuspension control materials, and by other protective measures.

D. Silt curtain shall be Gunderboom™ CPSC, or equivalent as approved by CH2M HILL.

E. Oil absorbent booms shall be Brockton Equipment Spilldam E810SN 8 inch x 10 foot sock and net, or equivalent as approved by CH2M HILL.

Attachment #2

Typical Moon Pool Construction Details

Attachment #3

Schematic of Silt Curtain System Layout

NOTES
1. Orthophoto: NJGIS, 2007
2. The Extent of Potentially Exposed Surface Sediment
   was generated from the -2ft (NGVD29) elevation,
   which represents the Mean Low Water for this part of the river
   The data source was the July 2011 Bathymetry Survey conducted
   as part of the RM 10.9 Characterization Program (CH2M HILL & AECOM, 2012)
3. Dredging layout is shown for illustrative purposes and that actual layouts will vary during the work

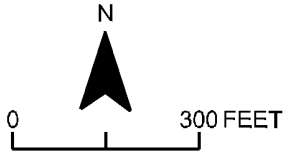

Figure 4-7

Dredging Operations Layout

RM 10.9 Removal Action Draft Final Design Report

Lower Passaic River Study Area, New Jersey

CH2MHILL

WBG061112074310WDC Draft Final Figure 4-7_v7

Addendum 4:
Statement of Compliance with Subchapter 10 rules of the Flood Hazard Area Control Act

RM 10.9 Removal Action compliance with
7.13-10.1 Requirements for a regulated activity in a channel

- The basic purpose cannot be accomplished without disturbance to the channel.
- Disturbance to the channel is minimized both in terms of quantity of sediment being removed and by replacement of that sediment with materials that will have a surface roughness equivalent to that of the material being removed.
- Cap materials have been designed to withstand velocities associated with bank-full flows, which will provide low-flow aquatic passage consistent with the original river bottom.
- All temporarily disturbed sections of the channel are being restored to pre-removal action conditions replicating channel shape and width, and accommodating anticipated flow rates and velocity and substrate type.
- There is no aquatic vegetation in the existing Removal Area, and the replacement cap will use materials suitable for natural re-establishment of aquatic habitat.
- This work is necessary to improve the ecological health of the River.
- The construction equipment that will be used is designed for environmental dredging work.
- The sediment bed is firm, the approaches to it are all from deep water, and the dredging and capping activities will not cause or exacerbate bank erosion.
- Silt curtains will be utilized for sediment control to minimize contact with flowing water and they will be removed after completion of the project.
- Booms will be available on the work craft should any sheen be observed or released associated with the Removal Action.

RM 10.9 Removal Action compliance with
7.13-10.2 Requirements for a regulated activity in a riparian zone

- No vegetation will be disturbed, removed or replanted as a result of this Removal Action other than the minimal cutting of overhanging tree branches near the banks of the river, where necessary to allow waterside access by the dredge rig.
- No railways or roadways or utility lines are being constructed or disturbed as a result of this project
- No eroded banks or channels exist within the Removal Area.
- The Removal Action will result in no changes to regional stormwater discharges.
- No buildings are being constructed or renovated as a result of this Removal Action.
- No flood control projects are proposed or associated with the Removal Action.
- The Removal Action is not a water dependent development along a tidal water.
- No activities are within upland areas and no upland vegetation in the riparian zone is being touched.

RM 10.9 Removal Action compliance with
7.13-10.3 Requirements for a regulated activity within a floodway

- No above ground structure will be constructed.
- There is no net fill (no rise in river bottom elevation).
- The cross-sectional area of the channel open to flow will not be reduced to less than the pre-dredge condition of the channel.
- There will be no obstruction of the passage of floodwaters within the floodway.

RM 10.9 Removal Action compliance with
7.13-10.4 Requirements for a regulated activity in a flood fringe

- The Removal Action is not occurring in, nor impacting the Flood Fringe.

RM 10.9 Removal Action compliance with
7.13-10.5 Requirements for a regulated activity in or along a water with fishery resources

- This portion of the Passaic River is not designated as a Category One waterway with exceptional fisheries resources.
- Activity will only occur outside of the migratory fish window.
- This portion of the Passaic River is designated as a non-trout water.

RM 10.9 Removal Action compliance with
7.13-10.6 Requirements for a regulated activity in a documented habitat or threatened or endangered species

- The Removal Area does not constitute a habitat for threatened or endangered species.

RM 10.9 Removal Action compliance with
7.13-10.7 Requirements for a regulated activity in an area with acid producing soils

- The sediment that will be removed does not contain iron sulfide minerals.

Addendum 5: PowerPoint slides to support a presentation to the Tidelands Council

River Mile 10.9 Removal Action Overview

Removal Action Schedule

Date	Activity
May – June 2013	• Baseline monitoring for surface and air quality • Small boats and moorings will be upstream, downstream, and within the Removal Area collecting water quality measurements
June 2013	• Mobilization of the equipment • Barges and dredging equipment will be mobilized from NJ harbor areas to RM 10.9
July – August 2013	• Dredging and barge transport, sediment stabilization, transportation and disposal at an out-of-state landfill • Dredging at RM 10.9 Removal Area from dawn to dusk six(6) days per week (~12 hours/ day) for about approximately 6-8 weeks • Barge transport for dredged sediments from Removal Area to the stabilization facility in the NJ Harbor area once a day and probably at night so that bridge openings will have minimal impact on the local traffic
	• Sediment stabilization at treatment facility • Train/truck transportation of treated sediment to an approved out of state landfill for disposal • Surface water and air quality monitoring
August – October 2013	• Barge transport of cap material to Removal Area from construction support area throughout the day • Cap construction at Removal Area from dawn to dusk six(6) days per week • Surface water and air quality monitoring; bathymetry surveys using small boats • Demobilization; removal of equipment from Removal Area out of the LPR